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FEDERAL COMMUNICATIONS COMMISSION  
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February 6, 1995

**HAND DELIVERY**

Mr. William F. Caton  
Acting Secretary  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, DC 20554

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Dear Mr. Caton:

On behalf of Capital Cities/ABC, Inc., transmitted herewith for filing with the Commission are an original and five copies of its Reply Comments in MM Docket No. 94-130.

If there are any questions in connection with the foregoing, please contact the undersigned.

Respectfully,

Dvora Wolff Rabino

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**FEB - 6 1995**

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

# Amendment of Parts 73 and 74 of the Commission's Rules to Permit Unattended Operation of Broadcast Stations and to Update Broadcast Station Transmitter Control and Monitoring Requirements

DOCKET FILE COPY ORIGINAL

**February 3, 1995**

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FEB - 6 1995

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF SECRETARY

In the Matter of )  
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Amendment of Parts 73 and 74 of the )  
Commission's Rules to Permit )  
Unattended Operation of Broadcast ) MM Docket No. 94-130  
Stations and to Update Broadcast )  
Station Transmitter Control and )  
Monitoring Requirements )

To: The Commission

REPLY COMMENTS OF CAPITAL CITIES/ABC, INC.

Capital Cities/ABC, Inc. ("Capital Cities/ABC") submits these Reply Comments to reply to comments made in response to the Commission's Notice of Proposed Rulemaking ("Notice"), released December 7, 1994, concerning the Commission's proposal to permit the unattended operation of broadcast stations and to update broadcast station transmitter control and monitoring requirements. Attached in support of these Reply Comments are Engineering Statements of Kenneth J. Brown ("Brown Eng.") and John H. Schmidt ("Schmidt Eng.") addressing matters within their respective areas of expertise and a Joint Engineering Statement ("Joint Eng.") addressing matters within their common areas of expertise.

In paragraphs 7 through 8 and 17 of the Notice the Commission seeks comments on eliminating the requirement for

duty operators at broadcast stations and the requirement, for those stations that choose to retain duty operators, that the duty operator should be required to hold an RP (a Restricted Permit). Capital Cities/ABC concurs with the Society of Broadcast Engineers ("SBE") (at paragraphs 1-10 of its comments) that eliminating the requirement that a licensed operator be on duty and in charge of a station all the time it is on the air is not likely to lead to a wholesale reduction of technical rules compliance, if a few safeguards are employed. These safeguards should include more frequent Commission monitoring and field inspections and use of the already operational voluntary, industry-wide certification procedure (described by SBE at paragraphs 26-27) to enable station licensees to determine that any individuals who do maintain or control the station transmitter systems are technically qualified to do so. In contrast with the National Association of Broadcasters (the "NAB") (see pages 11-12 and 15-16 of its comments), we believe recordkeeping and logging requirements must be retained to enable stations suffering interference to determine how, why, when and where such interference originated and to give those stations the data necessary to resolve the problem; we believe that preventing interference more than justifies the resulting additional operational cost and burden.<sup>1</sup>

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<sup>1</sup> See Joint Eng., section 1.

If the Commission eliminates the requirement that a licensed operator be on duty at a station at all times, certain guidelines should be established for preventing interference. We disagree with Broadcast Electronics in that many transmitters are not equipped with the automatic internal control systems that they discuss. We believe that a monitor circuit is necessary in an unattended automated system to assure that an interference causing failure does not occur without notification and corrective action. We also propose that stations (whether manually or automatically operated) be required to alarm or confirm operating parameters after changes in modes of operation, and often enough during operation to assure that FCC limits are not exceeded. We recommend following manufacturers' instructions (as suggested by SBE at paragraph 40) on checking monitoring instruments to maintain the requisite accuracy.<sup>2</sup>

In response to paragraph 13 of the Notice, we concur with the Commission that for stations choosing to remain operator controlled, the rules need not specify the operator duties precisely. However, we believe that the rules should continue to specify (as in current Rule 73.1860(d)) that the primary responsibility of a transmitter duty operator is to maintain the proper operation of the broadcast transmission system and

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<sup>2</sup> See Joint Eng., section 2.

that any other duties assigned to the operator should not be permitted to interfere with that primary responsibility.<sup>3</sup>

The Commission has asked for comments (in paragraphs 15 through 17 of the Notice) about the effect of unattended operation on maintaining antenna tower lights and monitoring Emergency Broadcast System (EBS) alerts. We believe that while automatic tower light monitoring is adequate to discover a light failure, manual observation is often needed to identify which light is out and to notify the Federal Aviation Administration.<sup>4</sup> We also believe, contrary to the NAB position (at page 17), that operators must be required to be present to monitor for emergency alerts as long as those stations and those they monitor continue to use the current, EBS system, which -- unlike the newer, EAS system ("Emergency Alert System") -- is not designed to be automated.<sup>5</sup>

We have security and practicality concerns about the proposal in paragraph 24 of the Notice that names and telephone numbers of contact persons be listed in an electronic data base accessible to all broadcast licensees and the Commission, and that they be posted at the station's transmitter site or transmitting antenna base. The on-line data base could be vulnerable to hackers; to correct such a problem, the Commission should flag all changed data and

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<sup>3</sup> Id.

<sup>4</sup> Joint Eng., section 2, at p. 4.

<sup>5</sup> Id.

confirm the changes directly with the licensees. Posting contact information on transmitter sites is often impractical as the sites are not generally accessible or visible to people standing on the ground, and posting home phone numbers or 24-hour control point numbers at a more accessible site could result in abuse or harassment; it would therefore be preferable to register contact numbers with building security, maintenance or front desk personnel or to post the number of an answering service at an accessible transmitter location.<sup>6</sup>

Finally, we agree with all the commenters who have expressed reservations about the proposal, in paragraphs 25 through 36 of the Notice and in proposed Rules 73.62(b)(2), 73.158(c) and 73.1350(d), that all out-of-tolerance conditions capable of causing interference be corrected within three minutes. The proposed blanket three-minute rule is vague, unworkable and counterproductive.

The proposed rule is vague because it does not define the conditions that must be corrected within three minutes. Telling licensees that they must hastily correct conditions that are out of tolerance or capable of causing interference without defining the acceptable parameters is like posting speed limit signs telling drivers that they may not drive too fast. If the Commission wishes to set time limits for correcting intolerable conditions such as overmodulation, it should define the acceptable and unacceptable levels of

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<sup>6</sup> Joint Eng., section 4.

interference and should provide guidelines for monitoring and correcting resulting problems.<sup>7</sup>

The proposed rule is unworkable because three minutes is never enough time for a technically qualified person to be contacted to analyze an interference problem and to make the appropriate adjustment or repair. Interference can be caused by a wide variety of factors, and the appropriate response depends upon the nature of the interference. We concur with the Association of Federal Communications Consulting Engineers (at page 6 of its comments) that the response time necessary for an appropriate correction will vary, depending on the circumstances; in our view it can range anywhere from fifteen minutes to three days.<sup>8</sup>

Finally, the proposed three-minute rule is counterproductive. Hasty action undertaken without the necessary technical consultations and analyses is likely to worsen rather than correct the interference.<sup>9</sup>

<sup>7</sup> Schmidt Eng. at section I.

<sup>8</sup> Joint Eng. section 3; Brown Eng.

<sup>9</sup> Joint. Eng. section 3; Brown Eng.



### Conclusion

For the reasons set forth above, Capital Cities/ABC concurs with the Commission's proposal to permit unattended operation provided that such a relaxation of rules is accompanied by the imposition of proper and realistic technical safeguards to prevent interference.

Respectfully submitted

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February 3, 1995



**JOINT ENGINEERING STATEMENT OF  
JOHN H. SCHMIDT, P.E., AND KENNETH J. BROWN  
IN CONNECTION WITH  
REPLY COMMENTS OF CAPITAL CITIES/ABC, INC.  
UNATTENDED OPERATION OF BROADCAST STATIONS  
MM DOCKET 94-130**

This statement has been prepared for filing in connection with the Reply Comments of Capital Cities/ABC, Inc., in response to the FCC's Notice of Proposed Rule Making (NPRM) into unattended operation of broadcast stations. This statement has been prepared jointly on matters in the above captioned docket which fall within the joint expertise of the writers. Each of us has also prepared a separate statement concerning matters which each of us has studied separately.

**1. Operator responsibility, licensee responsibility, and compliance.**

We concur with the Society of Broadcast Engineers (SBE) that eliminating the requirement that a licensed operator be on duty and in charge of a station all the time it is on the air is not likely to lead to a wholesale reduction of technical rules compliance, with certain caveats (SBE Comments at par. 1-10, NPRM at par. 7-8). While we believe that automation can adequately monitor and control station transmitter systems, probably better than most of today's duty operators, we believe that it is necessary that individuals adjusting or maintaining such systems need technical qualifications, for their own safety if nothing else, and a knowledge of the rules which is in no way assured by the Restricted Permit. The SBE Certification (discussed in SBE Comments at par. 26-27) is quite helpful in that regard.

We concur also with SBE that the check which responsible and knowledgeable licensed operators provided on station licensees has been largely eroded by the loosening of the operator requirement from a license which required demonstration of technical knowledge and familiarity with the rules to one which is, in essence, a mere registration. One of us has had several experiences where responsible operators holding Lifetime General Radiotelephone licenses called to the attention of management the effects of certain proposed "shortcuts" in time to prevent rules violations and potential interference from occurring. The only checks on outrageous station operations today are competitors complaining to the FCC and FCC inspections, but inspections are almost never held anymore. We concur with SBE that more attention to compliance by the FCC in the form of monitoring and field inspections is warranted, but there would appear to be no reason to retain the Restricted Permit (NPRM at par. 19-21, SBE Comments at par. 25).

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We find it troubling that the National Association of Broadcasters (NAB) has recommended (at III-B and F) that all recordkeeping and logging requirements should end. While this might save some money in the short term, it makes resolution of long term and recurring problems much more difficult. Worse, without records, a station caught operating improperly, particularly so as to cause significant interference, will have no way to support a claim that the condition is recent, not longstanding. A shortsighted interest in minimizing operating costs by a licensee cannot be allowed to disrupt surrounding stations and service to the public through uncontrolled interference, and since it is a long and expensive process to determine who is at fault in causing excessive interference, inability to demonstrate in any way that proper operation is the norm is simply irresponsible.

**2. Automatic Control Issues**

Direct, remote, and automatic monitoring and control are viable options. Relying on a stable transmitter without automatic control (NPRM at 9) is not adequate because sooner or later everything fails. Broadcast Electronics stresses the capabilities and reliability of automatic control systems in new transmitters, but does not discuss what can happen when control circuitry or reliance on stability fails. More important, many transmitters in use are not the most modern units with the automatic controls, though most are still very stable under normal conditions. We believe that, for an unattended automated system, a monitor circuit is needed to assure that the primary control (or reliance on stability) does not fail without notification and corrective action (NPRM at 10). This may be part of the transmitter, so long as the monitor can cause positive corrective action. Prompt response by a qualified human is the appropriate response to an alarm condition. Many possible means may be used to provide positive control, so long as the means used can be identified to an FCC inspector. The only real problem with automatic control (NPRM at 12) is protecting the computer controller well enough that it doesn't get blown up by lightning, and there are techniques today for doing that quite well. Note that positive transmitter control, the ability to positively shut down the transmitter, is needed in at least 5 cases: 1) where there is not enough automatic control at the transmitter to assure noninterfering operation, 2) for stations not participating in national EAS, 3) in event the studio is taken by force by persons not authorized by the licensee, 4) for shared time operations, and 5) for AM daytimers. We concur with SBE (Comments at 41-42) that the dialup telephone system is subject to failure or overload during times of disaster.

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For stations choosing to remain operator controlled rather than automatically controlled, it is not necessary to specify operator duties precisely (NPRM at 13), but it is necessary to require that first priority continue to be assigned to maintaining the technical operation, as Rule 73.1860 d currently requires. Improper operation occurring or continuing (as failure to switch operating mode) because the operator was busy with programming or making tapes or whatever, must not be permitted. It is also necessary to define how often parameters must be observed, as the present rules contain no adequate guidance.

For both manually and automatically operated stations, failure is most likely (NPRM at 11) when the system is disturbed; when power levels or operating modes are changed and during lightning storms, because that's when damaging voltage surges occur. An observation (manual or automatic) of parameters immediately after changing mode of operation is necessary to determine if the change occurred properly. Readings are equally or more important immediately upon cause to suspect improper operation (such as alarm notification, lightning strike on or near the facility or the power grid, or apparent distortion observed on the air monitor), to see if something has blown. Routine checks after each few hours of operation are a good idea to determine if temperature change or rainwater or small animals (snakes, lizards, rats, etc.) sheltering in the high power circuitry and getting burned up across the large insulators have caused disruptions to, or drift away from, proper operation. Older transmitters and less stable antennas require closer watching. Since automation controllers are unlikely to sense storm conditions, an automatic parameter scan at least once every 15 minutes or continuous alarm monitoring is appropriate and quite practical.

Some parameters (especially frequency) tend to be very stable. Monitoring frequency automatically (beyond the resources already part of the transmitter) may be a waste of time and adjusting it automatically is probably counterproductive (NPRM at 36). A monthly check of transmitter frequency should be adequate to guard against excessive slow drift, and our experience has been that sudden drastic frequency failures usually call attention to themselves in other ways (TV sync generators stop working or transmitters shut down). Stations which operate into bandpass filters or sharply-tuned antenna systems also have the protection that significant off-frequency operation may well shift the transmitter out of the passband, which causes the transmitter to shut down on reflected power indication.

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Calibration of test instrumentation to maintain the requisite accuracy (NPRM at 38) is best done according to the instructions and specifications of the manufacturer of the equipment, as suggested by SBE (Comments at 40). Some monitoring instruments need regular frequent checks, other equipment may seldom need checks.

Concerning remote and automatic tower light monitoring (NPRM at 15), it is not hard to tell that a light is out by monitoring the current drawn by the lights. It is tough to tell WHICH light is out on a tower (or group of towers) when all are powered through the same wires. Also, the more lights powered by one set of wires, the more difficult it is to sense one bulb going out. If multiple towers, each with its own flashing beacon, are fed from the same wiring, automation cannot tell which beacon is out. The same problem occurs with tall towers having flashing code beacons at several heights; manual observation may be needed to identify which light is out after automation finds a failure.

There is no useful way to automate the current EBS (NPRM at 16-17) if only because there is no end of message signal (contrary to NAB's assertion, Comments at IV), and there is no reason to try. The new EAS was designed to be automated. Operators should be required until stations and the sources they monitor have all converted to the new EAS, so that all alerts in an area will be automated. This might well cause some areas to move more quickly to the new EAS, but it is critical to assure that all stations will receive alerts and activate properly.

### **3. Response Time**

The issue of how quickly response is needed is raised by virtually all commenters. We concur with AFCCE (Comments at III-C-2) that how quickly a response is needed depends on what the out-of-tolerance parameter is and how serious the outage is.

Three minutes (NPRM at 28-29) is not sufficient time to analyze any problem. First, the operator in an attended station may be unavoidably detained (call of nature) for much or all of the three minute limit. Second, too short a period may result in an operator playing "remote control roulette" instead of clearly thinking a problem through or contacting more technically astute individuals. It is possible to make things worse by hasty action. If trouble indicators are reset by accident without recognizing or solving the actual problem, a relatively minor condition can be turned into a bad one. Third, the latency time with the average "beeper service" in a large city often exceeds three minutes, making it difficult for an

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operator (or computer controller making a programmed "help" call) to even contact a technically skilled person before time is up. Fourth, it is possible that the indicator could be bad, not the transmitter, and hasty action can disrupt a service without need.

The characteristics of a transmission are easily specified (NPRM at 33) by frequency, power, modulation characteristics, time of day, and directionality (tower lighting and EAS condition are important but not characteristics of the transmitted signal). All the measurements and signal observations ever required by the Commission have to deal with one or more of these. We believe that the parameters controlling these characteristics at any station operation can easily be identified, though it may well be inappropriate or impossible to regulate too specifically what precise parameters must be monitored to control these general characteristics, which may be NAB's concern (Comments at III-D).

Frequency may be the most important, because major frequency errors cause interference to adjacent channel stations, but the frequency controller is one of the most reliable pieces of station equipment and is relatively well protected from damaging electrical surges (NPRM at 36). Minor frequency errors are not damaging, while serious frequency errors (on the rare occasions they occur) generally announce and correct themselves immediately due to equipment characteristics already discussed. Detection of an off-frequency condition sufficient to interfere with an adjacent channel should be cause for immediate (upon detection) cessation of operation or correction (as by switching oscillators), preferably by automatic means frequently already implemented within the transmitter.

Underpower and undermodulation conditions hurt only the licensee and do not cause interference. Overpower and overmodulation conditions cause different amounts of potential interference, depending on the service and the amount. Modulation is discussed in Mr. Schmidt's Statement, attached.

The amount of interference caused by an overpower condition (NPRM at 34) depends mostly on how much overpower. Some stations operate with transmitters which are capable of no more than a few percent overpower, while other stations (especially those with multiple modes of operation) have transmitters which can easily produce many times authorized power. Clearly, the latter case calls for more stringent control. We concur with AFCCE (Comments at III-C-3) that a rapid termination period is appropriate for power in excess of two times authorized, since

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that is a severe problem, though we believe 15 minutes to be more feasible than three minutes. We also concur that two hours is a more reasonable period for power excesses less than double. But these are severe conditions. Many stations can never be faced with a possible condition of 150% power because the transmitter is simply incapable of making that much. A station whose transmitter is incapable of exceeding 150% of authorized power in all authorized modes of operation does not need to have as elaborate a shutdown mechanism as one which is capable of grossly overpower operation. However, prolonged operation above the authorized power tolerance is not acceptable, because prolonged excess interference, even if slight, does degrade the service.

Time of day is a critical parameter for stations with multiple modes of operation.

Incorrect AM directionality has the same effect as severe overpower in directions where signal suppression is required. It is necessary that interlocks be implemented such that a partial antenna pattern switch (some contactors closed in the wrong position) should cause transmitter shutdown, both because the resulting pattern is unpredictable and to prevent further damage to the transmitter and antenna system. We concur with AFCCE (Comments at III-C-5 thru 7) that, if switching the pattern fails and cannot be corrected within 1/2 hour, then power must be reduced to one-quarter of authorized power or operation must terminate until a technically qualified person commences dealing with the situation. A report of the occurrence should be forwarded to the Commission in compliance with the emergency antenna rules. A technically qualified person troubleshooting an AM directional antenna is a special case, as AFCCE points out (Comments at III-C-9). This is discussed further in the attached Statement of Mr. Brown.

**4. Other Concerns: Contact Person Posting and Database**

The primary concern we have with an on-line database (NPRM at 24) kept up by licensees is its vulnerability to "hackers". The computer literate person at a station is generally the technical person, not the owner. Where a contract chief is used, one individual may cover a number of stations. These data are unlikely to change too frequently; a way to have the Commission's database signal for confirmation of changed data is not likely to be a tremendous burden but would greatly improve security.

The proposal to require posting of the contact person's name and phone number "at the station's transmitter site on the

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structure supporting the transmitting antenna...visible to a person standing on the ground" (NPRM at 24) is impractical in many cases. Broadcast transmitter sites are generally fenced, for safety reasons, with fences at significant distances from the tower structure. These fences are secured and often alarmed. A posting on the tower is not likely to be visible outside the fence. Some sites are located in busy center city or in decaying areas in which posting the home phone number of the chief engineer or the 24-hour control point number of a broadcast station could result in considerable abuse and harassment. Posting the number of an answering service would be more appropriate. Many sites are atop buildings (office buildings, hotels, apartment houses). The site landlord is unlikely to permit postings in the lobby or on the building. Instead, registering contact numbers with building security or superintendent or front desk personnel, as appropriate, is much more practical. Indeed, transmitter rooms in buildings are often kept unlabeled as deterrents to vandalism and inappropriate access. The posting requirement should be rewritten more generally to assure that responsible persons can be reached when necessary.

DATED: February 3, 1995

John H. Schmidt  
John H. Schmidt, P.E.

DATED: February 3, 1995

Kenneth J. Brown  
Kenneth J. Brown





**ENGINEERING STATEMENT OF JOHN H. SCHMIDT, P.E.  
IN CONNECTION WITH  
REPLY COMMENTS OF CAPITAL CITIES/ABC, Inc.  
UNATTENDED OPERATION OF BROADCAST STATIONS  
MM DOCKET 94-130**

I am a Senior Audio Video Systems Engineer with Broadcast Operations and Engineering of American Broadcasting Companies, Inc. (ABC), a wholly-owned subsidiary of Capital Cities/ABC, Inc., with offices located in New York City. I have been employed by ABC for over 17 years. I have also been responsible for the technical operation of WBAU(FM), the radio station licensed to Adelphi University, for much of the time since it was licensed in 1972. My other qualifications are a matter of record with the Commission. I have over 29 years experience in the broadcast industry.

This statement has been prepared for filing in connection with the Reply Comments of Capital Cities/ABC, Inc., in response to the FCC's Notice of Proposed Rulemaking (NPRM) to permit unattended operation of broadcast stations and to update broadcast station transmitter control and monitoring requirements.

**I. OVERMODULATION**

The Commission makes proposals concerning overmodulation in paragraph 29 of the NPRM, and requests comment on the duration of the time limit for corrective action before a station would have to shut down for overmodulation in paragraph 30. In paragraphs 33 and 34, it proposes to place specific monitoring and adjustment requirements on all stations. These proposals do not, however, take into account the true potential (or lack thereof) for interference to other stations or services from overmodulation, nor do they account for the current state of technology as implemented in almost every broadcast station in the nation, and reflected in station operating procedures. Finally, the proposed rules do not settle a long standing uncertainty as to where the "line" between legal and illegal operation is. A number of the commenters have made suggestions concerning specific items involving modulation, but no one has provided the overview which this subject deserves.

In order to adopt meaningful rules, it is necessary to consider the modulation rules for each broadcast service individually, as the effect of overmodulation in each service is different.

AM stations potentially present the most serious problem. Overmodulation in the negative direction may present significant potential for interference to adjacent stations, due to the carrier "clipping". Positive overmodulation, up to at least 150%, is unlikely to result in interference, assuming the transmitter is not driven into nonlinearity. Really extreme amounts of unsymmetrical positive overmodulation may result in increased co-channel interference.

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For FM stations, the effect depends on the magnitude of the overmodulation. Modulation with peaks running to 105% or 110% is not going to create significant interference. The Commission, in rule 73.1570, states as much by allowing FM stations with SCA subcarriers to modulate as much as 110%. This degree of permitted "overmodulation" has not been shown to create any harmful interference. On the other hand, there is no question that modulation of, let us say, 200% could create serious interference to adjacent stations.

For TV stations, the effect of aural overmodulation, even gross overmodulation, is, in almost all cases, going to be distortion of the station's aural signal and possibly interference with the station's own visual signal. If the station uses a diplexer to combine its aural and visual carriers, overmodulation energy outside the diplexer notch width will end up either in the reject load or reflected back into the transmitter. Even if the station does not use a diplexer, the frequency allocations used are such that interference to other stations is unlikely to be created if modulation is under 200%.<sup>1</sup>

In modern radio and television stations, as commented by Broadcast Signal Lab (page 11) and Broadcast Electronics (page 4), the modulation is usually closely controlled by processing devices. No duty operator or automatic adjustment is provided; in fact, providing such an adjustment will probably result in more, not less, incorrect modulation. In almost all cases the actual modulation adjustment is a "screwdriver adjustment", made carefully by the Chief Operator or maintenance technician under controlled conditions.<sup>2</sup>

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<sup>1</sup>: This engineer represented Capital Cities/ABC Television on a committee sponsored jointly by the EIA and the NAB to attempt to produce an acceptable definition of 'what is a peak' (of the nature which would light a "peak light" on a modulation monitor if such a device had a standard) for BTSC stereo. While the committee's work was doomed to failure due to lack of agreement by its participants, all present did agree it is very difficult for TV aural overmodulation per se to create interference to other stations.

<sup>2</sup>: In fact, in the case of BTSC television stereo, adjustment of the limiter output under program conditions will result in incorrect operation of the system. Modulation is set with a tone while the stereo generator is in mono mode, and, assuming the BTSC encoder is operating properly, the modulation which results from a stereo program source is what you broadcast. Varying the input levels within the quite wide limits of the generator input will have little effect on the modulation due to the processing and the DBX encoding of the L-R signal. Varying the output level will seriously degrade the match between the DBX encoding in the stereo

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Small amounts of observed "overmodulation" in FM and TV stations may have several causes: Certain program material, usually of short duration, may create overshoots in the modulating audio, by "sneaking through" the limiter, ringing in the stereo low pass filters, overshooting in the stereo subcarrier modulator, or due to slight nonlinearities in the composite baseband transmission or modulation. In all such cases, the "problem" will go away when the character of the program material changes, and readjustment is only called for if there is too much "offending" program material.

There may also be perceived overmodulation indicated on modulation monitors picking up the signal "off the air" due to problems in the reception of the desired signal. Multipath and received interference (both natural and man-made) may result in overmodulation indications when none actually exists.<sup>3</sup>

Finally, there may have been a slight drift, either in the limiter output level, the gain of the transmission path between the limiter and the modulator, the gain of the modulator or the calibration of the modulation measuring instrument.

The overmodulation, if any, created by these conditions, while it may be in excess of the Commission's rules, is unlikely to create significant interference to other FM or TV stations, even if uncorrected for some time, and there is no need for a mandatory shutdown within three minutes as proposed in paragraphs 28 and 29 and a proposed new rule 73.1350 (d) and (d) (1).

What is of more serious concern is a component failure causing gross overmodulation, such as a limiter failure. In such a case, there is, for AM, FM and possibly a few "common mode"<sup>4</sup> TV stations, a serious potential to create interference. However, attempting to adjust the modulation, either automatically or manually, will of course be unsuccessful; if the station does not have backup equipment to switch to, it will have to shut down until the defective equipment is repaired or replaced.

Adding to the problem is the lack of a good definition for overmodulation, the lack of standards for modulation monitoring equipment, and the fact that stations are currently not required to monitor modulation on a continuous basis. The Commission says

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generator and the DBX decoding in stereo televisions, and cause severe "pumping" of the decoded audio.

<sup>3</sup>: Off air AM modulation monitors are also prone to significant inaccuracy due to noise and other interference.

<sup>4</sup>: Stations using a common RF amplifier for visual and aural signals.

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modulation shall not exceed the specified percentage on "peaks of frequent recurrence", and yet has never defined what frequent recurrence is. The ATS rules used to contain a strict definition which was different from what was generally construed to be "peaks of frequent recurrence" but the current rule (73.1500) simply says the ATS must incorporate circuits that will terminate operation within three minutes if the adjustment controls do not correct an operating condition which is capable of causing interference, without specifying what that operating condition might be.<sup>5</sup>

Comments by the AFCCE (page 6 paragraph 3) concerning paragraph 29 of the NPRM suggest a shutdown in a short period if modulation continues to exceed 150% due to component failure, and no successful corrective action were taken. This would seem to be a reasonable rule for FM and TV stations, although, as most of the other commenters have pointed out, three minutes is too short a period before a required shutdown. Requiring shutdown in 15 minutes if modulation continues above 150% is a compromise which adds little likelihood of significant interference, while making unnecessary shutdown unlikely.

As alternate means of implementing overmodulation protection, the Commission might consider giving unattended stations a choice of 1: installing a detector with a timer to shut down the transmitter in the event of continuing uncontrolled severe overmodulation or 2: installing some form of "protector" independent of the main limiters and sufficiently "downstream" in the audio path to protect against interfering overmodulation caused by most component failure. The second alternative might only require some very simple circuitry to serve as a protective clipper in the audio path. This clipper does not have to be psychoacoustically pleasing or protect the various subcarriers of FM and TV stations, as its only purpose

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<sup>5</sup>: If the Commission is going to adopt new rules such as the proposed 73.1350, it is going to have to take up that thorny problem: What is acceptable modulation and what is not, when broadcasting program material. It is also going to have to come up with meaningful specifications for a modulation monitor and its peak indicator, to replace those eliminated in the early 1980's. On July 23, 1993, the Commission initiated a Notice of Inquiry, MM Docket 93-225, to examine these and other issues concerned with control and measurement of aural modulation in broadcast stations. As far as I know, this inquiry is still pending with no action taken. If the Commission wishes to require automatic control of modulation levels, or set new limits on normal modulation levels, and require stations to install equipment to continuously monitor modulation, it would be administratively preferable to reopen comments in that docket. This would avoid having two dockets concerned with the same subject open at the same time.

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is to prevent interference in the event of audio chain failure.<sup>6</sup>

In the future, manufacturers might consider including circuitry in new FM exciters or AM modulators to reduce the probability of overmodulation likely to cause serious interference to others, either because the modulator is being overdriven externally, or due to a component failure internally. The additional cost for these components should be trivial, and they would provide built in redundant protection against serious overmodulation. This protective circuitry should not be "active" when the exciter or modulator is operating normally, or even being slightly overdriven. It should only become active when conditions which might create serious interference occur.

Since modulation is not, and should not be, a duty operator adjustment and since an unattended station would have no one present to monitor it anyway, there is no need for stations to be required to install expensive dedicated equipment to continuously or routinely monitor modulation, provided it has protective equipment to prevent continuing severe overmodulation due to equipment failure, as I have suggested in the two above paragraphs.

Each station does, however, need to have some means for its technical staff to determine whether the modulation control equipment is functioning properly. How often this must be done depends on a particular station's experience with the stability of its audio processing equipment. While I glance at the modulation at WBAU weekly or more often, I believe I have only adjusted the actual modulation level once or twice a year for the past several years, and these adjustments have amounted to tenths of a dB. I suspect that the drift in the modulation monitor may be greater than the drift in the actual modulation of the transmitter.

Many stations will probably continue to use modulation monitors, even though they are not required, simply for their convenience. Other stations may choose to use a calibrated oscilloscope (as the Commission itself does when it measures stations), or some other equipment to verify proper modulation.

Proposed rule 73.1350 (c) (1) should be revised to make it clear that the Commission is not turning the clock back to 1980, and requiring all stations to re-install "modulation monitors" and operate them full time.

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<sup>6</sup>: In fact many FM stations which have installed a "composite clipper" ahead of their exciter already have installed such a protective clipper. If the main limiter fails to control the audio, most composite clippers will prevent the transmitter from being grossly overmodulated.

None of this would preclude the Commission from citing, let us say, an FM or TV station which continuously ran modulation approaching 120% (or 50% for that matter), even though the station is unlikely to create interference to others. While the Commission should be most concerned about stations which create interference, the public interest requires that the normal operation of broadcast stations complies with standards adopted to assure uniform reception and allow for standardization of receiving equipment.<sup>7</sup>

## **II: METERS AND OPERATING LIMIT TOLERANCES**

The proposed rule 73.1350 has a problem in paragraph (c). It is impractical to require remote control meters to comply with rule 73.1215. In many cases, there is now no meter at all, the read out either being numbers on a computer screen or a computer generated "voice" over the telephone. If this requirement is only for the main meters at the transmitter, which is what I assume was intended, the language needs to be clarified.

Paragraph (c) (2) would seem to move the meter calibration tolerances "inside" the permitted operating limits. Current practice adds them to the operating limits, and, in some cases, it may be impractical (and frankly, unnecessary) to shift the tolerance without opening the operating limits. The calibration of the direct power meter for an FM station using the direct method is required to be within 2% at full scale reading (rule 73.1215) and the calibrating standard is only required to be itself calibrated within +/- 5% accuracy (rule 73.267 (b) (2)). The calibration tolerance requirement for remote control telemetry seems to have disappeared from the rules but has been traditionally within 2% of the main meters. (The 2% requirement still exists for extension meters in rule 73.1550.)

Given these tolerances, it is possible, with all meters within tolerance, for the operator to be reading 97% on his meter while the transmitter is actually operating between 105% and 106% of licensed output. It is just as possible for the transmitter to be operating below 90%. Furthermore, if the Commission field engineer were to bring his own standard to check the calibration, it is possible for his standard to be inaccurate by another 4 or 5%, thereby making it appear that the transmitter was producing 110% of licensed power. While statistical probability may make it uncommon for all the tolerances to add in one direction, the licensee should

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<sup>7</sup>: While the Commission is considering updating the modulation rules, it might consider deleting rule 73.1570 (c). Current operating practice has made this rule obsolete, and I believe there are few, if any, stations which literally comply with this rule, for better or worse.

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not be held hostage to the fickle chances of luck. This proposed rule, as worded, is unworkable. The existing rules and policy have been adequate, and as NPR comments (page 6), "(T)here is no need to require licensees to include calibration tolerances within permissible operating tolerances."<sup>8</sup>

DATED: February 3, 1995

John H. Schmidt  
John H. Schmidt, P.E.

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<sup>8</sup>: Harold Hallikainen, President of Hallikainen and Friends, a manufacturer of transmitter control and telemetry systems makes this same point in an article in the January 25, 1995 issue of Radio World discussing this proposed rulemaking. He includes a similar example involving AM stations and remote antenna ammeters. He does not appear to have filed formal comments in this proposed rulemaking, but the Commission may want to consider his published article as informal comments.



**ENGINEERING STATEMENT OF KENNETH J. BROWN  
IN CONNECTION WITH  
REPLY COMMENTS OF CAPITAL CITIES/ABC, INC.  
UNATTENDED OPERATION OF BROADCAST STATIONS  
MM DOCKET 94-130**

I am Manager of Allocations and Licensing for the American Broadcasting Companies, Inc., a wholly-owned subsidiary of Capital Cities/ABC, Inc., with offices located in New York City. My education and experience are a matter of record with the Federal Communications Commission.

This statement has been prepared for filing in connection with the Reply Comments of Capital Cities/ABC, Inc., in response to the FCC's Notice of Proposed Rule Making (NPRM) into unattended operation of broadcast stations. This statement deals specifically with AM directional antenna issues. I have over 26 years experience in the broadcasting industry and have been working with AM directional antennas for some 19 years.

I am concerned generally with the apparent attempts to revise regulations controlling AM directional antenna systems as part of the unattended operation proceeding when MM Docket 93-177, An Inquiry into the Commission's Policies and Rules regarding AM Radio Service Directional Antenna Performance Verification, remains open and unresolved. Most of the AM-DA changes proposed in the instant NPRM fly in the face of proper and even possible operation. The purpose of controlling directional antenna systems is to minimize interference, and instrumentation has been refined over decades to maximize knowledge and understanding of array conditions. The Directional Antenna docket was opened to consider updating requirements in response to new understanding of the subject. Most of the changes proposed in the instant NPRM, however, would likely lead to unnecessary misadjustment and loss of reference conditions leading to more, not less, interference.

The discussion at paragraphs 30-31 of the Notice is inadequate for correctly dealing with directional antenna monitor points, and the draft rules even ignore the meat of that discussion! AM directional stations have the greatest capability of causing prohibitive interference to other stations, but directional antenna design and adjustment, especially using measured field data, is probably the most complex and error-prone function of all station operations. Particularly, directional antenna adjustment is a matter to be dealt with by qualified and experienced field engineers in cooperation with their counterparts in the FCC's AM Branch, since cases and antenna systems are so varied that almost any rule will be excessively arbitrary. Generally, though, if parameters are out of tolerance, it may be presumed that power



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reduced to get monitor points below their maximums is appropriate, but this cannot be accomplished in three minutes. If parameters are in tolerance and a monitor point shows high, it should generally be presumed that the monitor point is wrong, the antenna is in adjustment, and power reduction is most inappropriate pending evaluation of the monitor point. This is particularly so when extreme weather conditions (blizzard, flooding, etc.) exist. "Cranking on the array" in response to a monitor point out of tolerance is among the fastest ways to get a directional antenna system seriously out of adjustment, because the data are inadequate and suspect.

In response to Paragraph 34 of the Notice: The automation must be able to switch a directional AM among its modes of operation and confirm proper switch occurred. It may under no circumstances ever be expected or allowed to adjust antenna parameters using variable controls on the antenna system, for several reasons including interaction among the controls!

Proposed Rules 73.62(b)(2), 73.158(c), and 73.1350(d)(2) are, in most circumstances, absolutely impossible to comply with. Remember that a monitor point for an AM directional antenna system or array is not a sample available at the station to be input into a control device but rather a geographic point located usually between 3 and 10 kilometers from the transmitter site in a direction of concern. Monitor points cannot be located too close to the station because of the physics controlling formation of the pattern. The number of points depends on the complexity of the array. There are generally different points for each directional pattern. In short, monitor points are simply geographic locations at which field measurements are made, which have been selected from among many similar points by a process involving statistical analysis to provide reasonable indications of array performance in the monitored directions.

In order to measure monitor points, it is necessary for a technically competent individual to establish the mode of operation at the station which is to be measured, confirm operating parameters, enter a vehicle (usually a car but may be a bus, subway, etc.) with a portable, battery-operated field measurement instrument, proceed (drive) to the vicinity of the first point, exit the vehicle and walk to the precise location, calibrate the field meter to its internal reference, and make a measurement. The vehicle is then re-entered to proceed to the next point or to return to the station. THIS IS NOT A THREE MINUTE PROCESS!!! There are seldom public phones near monitor points. The Commission cannot realistically require a station to have wireless communications such as two-way radio or